PART 1 - GENERAL

1.1 Scope of Work:

- A. Furnish a heat transfer package (HTP) as per attached schedule and as described in this section.
- B.The package shall be shipped in one section unless stated otherwise in the schedule. If package is split, one section shall consist of the heat exchanger and the steam control valve; the other section shall contain the rest of the package.

1.2 Manufacturers

- A. The following manufacturers are acceptable:
- 1. Bell & Gossett
- 2. Armstrong 3. Cemline

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, weights (shipping, installed, and operating), furnished specialties and accessories; and installation and start-up instructions.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loading, required clearances, and methods of assembly of components.
- C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring required for final installation. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- D.Maintenance Data: Submit maintenance data and parts list for the heat exchanger, pump parts, control, and accessories; including "trouble-shooting" maintenance quide. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual. Provide 3 copies of above.

1.4 WARRANTY

A.Complete Package Warranty:

1. The complete package shall be warranted for a period of 12 months from the date of acceptance of the installlation by the University; 5 years for heat exchanger.

1.5 INSURANCE COMPANY

- A.The Owner's insurance company is Factory Mutual.Package components shall meet all of the requirements of F.M., whether or not indicated in the plans and specifications, for each device and/or component.
- B.The complete control panel, assembled shall meet U.L. requirements.

1.6 SHIPPING AND HANDLING

- A. The package is to be delivered to the University of Michigan, Athletic Campus, Plant department loading dock, 326 East Hoover Ave, Ann Arbor, Michigan.
- B.Shipment: Shipment of unit to be F.O.B., Manufacturers plant with freight prepaid and allowed to job site, or any other location designated by Project Engineer. All truck services will be arranged by manufacturer with a minimum notice of seven (7) working days to U of M Project Engineer in advance of delivery. Delivery to be between the hours of 8:00 a.m. and 2:00 p.m. on a normal work weekday. Call Dennis Kretin (734)615-7350 for instructions.

1.7 PROPOSALS

A. With the bid submit a proposal. Proposal shall state all selection parameters, clearance dimensions, pipe size connection, location and orientation of flanged connections. With proposal submit (3) three copies if the shop drawings specified under shop drawings. These will be reviewed and returned with the purchase order to the successful bidder. Submit (9) nine copies of approved shop drawings within 3 weeks of receipt of the purchase order.

1.8 DELIVERY AND PRICE BASIS

A.Award of contract is anticipated within two weeks of receipt of proposals. Delivery of unit is required within (6) six weeks of the receipt of the letter of intent or purchase order. All prices must be firm from date of proposal unless otherwise stated. In the prices quoted, include any additional premium time costs involved to meet the delivery date.

1.9 SHOP DRAWINGS

- A. Submit two (2) copies of the following project specific items for approval and return with the purchase order.
- B. Product Data: Include catalog illustrations, model, rated capacities, performance, weights, dimensions, power and utility requirements, rigging, installation and support details and instructions. Include written sequence of operations for all controls.
- C.Product Data: Heat Exchanger, pumps, control valves, instruments, traps, relief valve, vacuum breaker, circuit setter and controls.

- 1. Installation Drawings
- 2. Check, Test and Start Reports
- 1. Maintenance schedule 2. Recommended spare parts

PART 2 - PRODUCTS

including heat exchanger, simplex pump and motor, isolation valves, relief valve, temperature and pressure gauges, frame, interconnecting piping motor starter, control panel, steam valve assembly, integral temperature control system including fail safe maximum DHW temperature limiter, and condensate trap and pump assembly.

- 1. The system shall be completely piped requiring only necessary single point connection for electrical, steam, condensate return, hot water system supply and return piping connections. The unit shall be fully piped, wired, tested, and mounted on steel frame. The available space for the system will be dictated by existing conditions.
- 2. The package shall be shipped as one package with no assembly required.

2.2 Heat Exchanger:

- A.Shell and tube type, straight/ U tube removable tube bundle, steam in shell, water in tubes, equipped with support cradles and leak port indicator.
- 1. Maximum tube velocity: 6.0 feet per second. 2. Tube fouling factor: 0.001, unless indicated otherwise.
- 3. Materials:
 - a. Shell: Steel b. Tube sheets and tube supports: Non-ferrous c.Tubes: 3/4 inch OD ASTM A-312 Type 316 stainless steel
- d. Head or bonnet: Cast Iron or Steel 4. Construction: In accordance with ASME Pressure Vessel Code and stamped U-1 for 150 psig working pressure for shell and tubes. Provide manufacturer's
- 5. Heat exchangers shall utilize copper, stainless steel or other non-corroding, non-ferrous, metals for any areas, which contact the potable waters. Heat exchangers shall be double walled and meet the latest requirements of Michigan Plumbing Code and Department of Public Health. Provide R-5 insulation with 20 gauge jacketing on shell, provide 5 year warranty on exchanger.

certified data report, Form No. U-1.

2.3 Pumps:

- A. Pumps shall be as scheduled and shall be in line circulating type, single-stage.
- 1. Pumps: Pumps shall be system lubricated, in line cartridge bronze body, sleeve bearings, enclosed impeller, alloy steel shaft, CU/NI shaft sleeve, rated
- B. Pump motor shall be factory installed, NEMA design, ball bearing type with electrical characteristics and horsepower as specified. Coupled motors shall be 3500 RPM, TEFC or open drip-proof guarded type, universal mount.

2.4 Valves and Accessories:

- A.Provide isolation valves. All components for DHW shall be rated for 140 F cont.; steam components 350 F.
- B.Isolation and drain valves through 2" shall be ball valves, two-piece, full port, bronze body, stainless steel ball and stem, Teflon seat, plastic coated lever handle, balancing stops and locking devices.
- C.Manufacturers: Jomar T-100-SS and S-100-SS, Jamesbury series 300, Grinnell 3700-6 and 3700SJ-6, Watts series B-6000, Nibco
- D.Circuit setter shall be bronze body, brass ball, TFE seats, memory stop, calibrated name plate position indicator, valved ports.
- E.Manufacturers: Bell and Gossett, Circuit Setter Plus.
- F.Steam Control valve: Features Electronic or pilot operated capillary actuator, fail safe closed, bronze body, stainless steel wetted parts.

2.5 Inverted Bucket Trap:

- A.Trap shall be inverted bucket type of all stainless steel construction which resists distortion due to freeze up and water hammer. Trap to have forged body and drawn cover fully weld-sealed against leakage. Operation shall be self-priming, with orifice size selected for the capacity required by application.
- B.Manufacturers: Armstrong Series 2000, ITT Hoffman, Spirax-Sarco UIB Series, Watson McDaniels.

2.6 Float and Thermostatic Trap:

- A.Stainless steel maintenance free sealed ball float steam trap with an integral automatic air venting
- B.Traps to be zero maintenance and be connected to a separate universal inline connector(see 2.12), by two bolts to allow for quick and simple installation/
- C.Manufacturers: Armstrong AB-2000 Series, ITT Hoffman, Spirax-Sarco UFT Series, Watson McDaniels.

2.7 Frame:

- A. The frame shall be heavy-duty channel and angle iron construction prime and epoxy finish painted. The frame material shall be ASTM A36 structural steel.
- B. Heat exchanger shall be secured to the frame by means of a saddle. Piping shall be arranged to permit easy removal of heat exchanger tube bundle.

2.8 Pressure Vessels:

A.All pressure vessels (heat exchanger) shall be ASME constructed for a 125-psig-design pressure and bear ASME stamp. A manufacturer's Data Report for pressure vessels, Form U-1 as required by the provisions of the ASME Boiler and Pressure Vessel Code, shall be furnished.

2.9 Control Cabinet:

- A.NEMA 1 UL approved, factory wired, enclosing all controls, with indicating lights, H-O-A selector switch, manual disconnects, and resets mounted on the outside of the panel. Attach cabinet to the frame with rigid steel framework.
- B.Motor Starters: The control panel shall be equipped with a magnetic combination fused starter. Provide a non-fusible flange mounted disconnect switch, interlocked with a door and screw operated bypass.
- C.Electric wiring: Wiring from the control cabinet to the equipment shall be suitable for 200 degrees F service; enclosed in liquid-tight flexible metal conduit.
- D.No other control wiring or devices other than those supplied with the package shall be required for the system to operate as described.
- E.Control Features and Functions: Provide solid state control module with pilot lights for on/off, primary high limit and secondary high limit, with programmable/adjustable set points. Include audible alarm and spare set of output contacts for remote annunciation of alarm condition. Fail safe features shall be provided via positive steam valve shutoff, DHW safety solenoid valve, and/or pump stop whereby domestic hot water supply cannot exceed 125F. (Adjustable)

- Pipe: Black Steel, Schedule 40, ASTM A 53, seamless. Fittings: 2000# Forged steel fittings.
- Pipe: Black steel, schedule 80, ASTM A 53.
- Fittings: 2000# Forged steel fittings.
- Pipe: Type K copper, hard drawn, ASTM B 88. Fittings: Wrought Copper, ANSI B16.22

2.11 Pump Trap:

- A. The pump trap shall be operated by steam to 80 psig. No
- B.Body construction from SG iron ASTM A395 dual certified ball type outlet check valve. The internal trap mechanism internal trap. The pump trap and check valve mechanisms shall be incorporated into the same body envelope with no external seals or glands and shall be capable of operating with a minimum 7.8 inches installation head from the base of the unit.
- C.Manufacturers: Spirax Sarco, Bell & Gossett or Armstrong.

2.12 Universal Inline Connector

- 1. Connector body shall be ASTM A351 stainless steel.
- the pipeline. Trap shall be attached to the connector and replacement.
- be 9" long with white aluminum back and black graduation, aluminum or polyester casing, red appearing liquid tube, glass window. Stem for air duct shall be 12" long with Stem for piping shall be 3-1/2" long aluminum, brass or stainless steel stem to match specified thermometer well. Adjust stem length for insulation extension.
- otherwise noted, select range for maximum precision for system served: 2.Manufacturers: Ashcroft, H. O. Trerice, Marsh, Weksler.

Service	Range (deg.F)
Domestic Hot Water	30-180

3/4"NPT, 2 1/2" insertion length, and 3 1/2" extension length.

2.14 Pressure Gauges

- A.Provide all pressure gauges with clear window, cast movement, and 1/2" MPT socket, 2 1/2% accuracy complying
- B.Water and Compressed Air Services through 2" piping: 2 1/2" diameter face, stainless steel case and 1/4" MPT socket.
- C.Water and Compressed Air Services over 2" piping: 4 1/2 diameter face, sealed glass window, glycerin filled for connections within 10 feet of pumps.
- D.Steam Service: Include sealed glass window, brass coil siphon tube.
- operating pressure: | Service | Range | 0-100 psig | Water (HW) | 30" Hg vac. - 30 psig | Steam(15#)

F.Manufacturers: Ashcroft, H. O. Trerice, Marsh, Weksler.

B.Manufacturers for Plugs: Petes, Sisco, Schrader.

- 2.15 Pressure/ Temperature Test Plugs and Kits
 - where shown on drawings, with two core Nordel rated for 275 degrees and 300 psig.

LOCATION

PROJECT APPLICATION NOTES

- 2. THIS SHEET IS GENERALLY USED WHEN IN A EXISTING BUILDING, DHWR LINE FROM TUNNEL IS REMOVED AND REPLACED WITH A HEAT EXCHANGER. TYPICALLY WORK IS DONE BY TUNNEL CREW WITH NO CONTROL CONTRACTORS
- DETAILS PER DESIGN GUIDELINES. . THE SPECIFICATIONS APPLY WHEN U OF M PREPURCHASES THE HEAT TRANSFER PACKAGE. EDIT IF PURCHASED AND

2.16 Vacuum Breakers

- A.Brass body, stainless steel retainer tube, ball and spring, rated for 365 F, 300 psig.
- B.Manufacturers: Johnson VB8, Anderson Snow.

2.17 DHW Pressure- Temperature Relief Valves

A.Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, ANSI Z21.22. Factory set at 210 degrees F, and 150 psig. Size valves in accordance with ASME DRIP Boiler and Pressure Vessel Codes. Manufacturers: Watt series 40, 140, 240, 340, Spirax-Sarco, Leslie

2.18 Air Filter Regulators

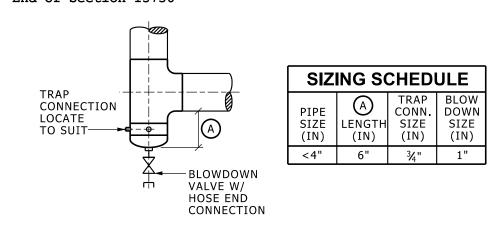
- A.Combination compressed air filter/regulator with local pressure indicator, designed to remove water, oils and solid contaminants. Epoxy painted aluminum body, quick disconnect bayonet type bowl with local liquid level indicator, manual drain, 5 micron replaceable polypropylene filter, neoprene/nitrile seals, rated 250 psig at 175 F. Local gauge minimum 1-1/4 inch diameter, indicating pressure in psig, 0 - 150 psig range minimum.
- B.Connection sizes and flow capacity compatible with pressure powered pump maximum consumption rating manufacturers: Johnson VB8, Anderson Snow.

C.Flowserve Worcester model FCD WCAPS 1053 or equal. PART 3 - EXECUTION

3.1 Installation

- A. Install HTP unit as recommended by the manufacturer and as shown on the drawings.
- B.Connect the electrical service to the control panel terminal block as shown by manufacturer and required by codes. Make all connections to equipment as recommended by the equipment manufacturer as far as traps, drains, etc., and as required by the contract drawing schematics.
- C.Fill and vent the system of all air. Purge the pump of air as recommended by the manufacturer; then check for proper rotation and alignment. Adjust the equipment for operation, check all controls, and verify that all safety devices are functioning properly.
- D.Check all pipes for leaks. Correct any problems as soon as found. Place pump in service and check power draw, voltage, and proper system operation.
- E.Operate the system as a test and demonstrate to the Owner that the system is functioning properly. Report the actual current draw and pump flow.

End of Section 15756



TUBING

'----'|

BUILDING

BUILDING

CA(80#)

FROM '

TUNNEL

CA(80#)

BUILDING

STEAM DRIP LEG DETAIL NO SCALE D 15525 02 10 04.dgn

KEY NOTES

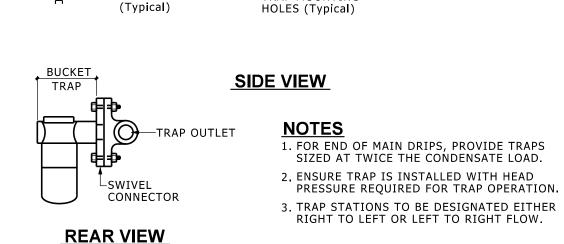
SWITCH TO START AND STOP THE PUMP. PROVIDE

(2) DHWR LEAVING THE PACKAGE SHALL BE MAINTAINED AT ADJUSTABLE 120 F, CLASS IV SHUTOFF VALVE: HOFFMAN STEAM REGULATOR WITH 2000 FTRA SENSOR OR ARMSTRONG STEAM REGULATOR OB 2000L. FAIL SAFE -

- 3 SCHEDULE 40 BRASS NIPPLE.
- (4) NPT BRASS UNION (Typical). (5) PUMP, SPIRAX-SARCO/PPEC, ARMSTRONG/
- (10) THERMOSTATIC TRAP STATION, ARMSTRONG/ SERIES TT-2000 W/TVS 4000, SPIRAX SARCO/ UTD52 SERIES W/UBP32 THERMOSTATIC TRAP
- 11 BALL VALVE (BRONZE BODY), JOMAR T-100-SS OR S-100-SS. (Typical)
- (13) HEAT EXCHANGER
- 16 FLOW CONTROL VALVE, B&G CIRCUIT SETTER

PACKAGED STEAM TO WATER HEAT EXCHANGER PUMP SCHEDULE DHW HEAT TRANSFER PACKAGE STEAM SHELL DHW PUMP _____, PUMP TRAP ELEC REQUIREMENTS MOTIVE AIR HEAD TEMP (°F) LINE SIZE FLOW PRESSURE FLOW * HEAD BASED ON (MBH) (GPM) PRESSURE (IN) IN OUT (IN) (PPH) (PSI) | (GPM) | (FT) | TYPE | HP | VOLTS | PHASE | (PSI) MANUFACTURER/MODEL REMARKS INLINE I

UNIVERSITY OF MICHIGAN 450F 1HR EXCURSION → HPC, LPC, OR PC DESIGN P&T RECEIVER (LPC) —--GOR FLASH RECOVERY VESSEL (HPC) MOUNTED HERE 4' Max. (LPS) 10' Max (HPS) (Typical) TEST TEE

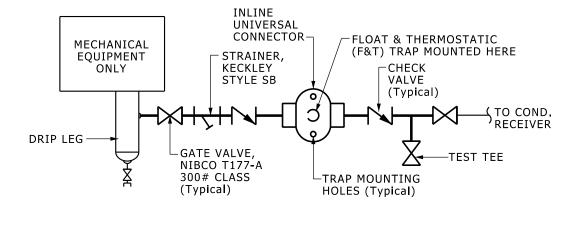


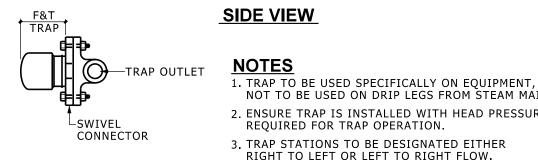
LTRAP MOUNTING

BUCKET TRAP

VALVE

BUCKET STEAM TRAP ASSEMBLY DETAIL NO SCALE D 15525 05 08 09.dan





REAR VIEW

NO SCALE

5 TO 9 } −

FLOOR

9-

RESERVOIR

EXCHANGER

. _ _ _ _ _ _ _ _

DRAIN

FLOOR

RECIRCULATION DHW

HEAT TRANSFER PACKAGE DETAIL

* EXTERNAL TO SKID

MOUNT ON SIDE-

DESIGN LIMIT

└GATE VALVE

NIBCO T177-A

300# CLASS

INIINE

-STRAINER

KECKLEY

STYLE SB

UNIVERSAL

CONNECTOR

NOT TO BE USED ON DRIP LEGS FROM STEAM MAINS. 2. ENSURE TRAP IS INSTALLED WITH HEAD PRESSURE REQUIRED FOR TRAP OPERATION. 3. TRAP STATIONS TO BE DESIGNATED EITHER

F&T STEAM TRAP ASSEMBLY DETAIL

RIGHT TO LEFT OR LEFT TO RIGHT FLOW.

D 15525 01 08 09.dgn (1) CONTROL PANEL SHALL INCLUDE AN ON/OFF

> POWER FROM THE SAME SOURCE AS THE EXISTING DOMESTIC WATER CIRCULATING PUMP.

(6) 316 SS THERMOSTAT ON DHW. (7) COMPRESSED AIR PRV STATION - PRV, AIR ILTER & BALL VALVES ETC., SET@50PSI. MOUNT ON WALL ON 1/2" PLYWOOD. SEE

(9) THERMOSTATIC AIR VENT.

- PLAN FOR LOCATION. (8) VENTED ENLARGED PIPE (2"DIA x 24"LONG MINIMUM) OR RECEIVER. ELEVATE MINIMUM 6" ABOVE PUMP TRAP, BUT MINIMUM 10" BELOW HEAT EXCHANGER.
- (12) CHECK VALVE, CHECK ALL.
- (14) RECIRCULATION PUMP: B&G SERIES (PL) (15) 316 SS THERMOWELL ON DHW.
- PLUS, CALIBRATED BALANCING VALVE. (17) PRESSURE GAUGE.
- (18) TEMPERATURE/PRESSURE RELIEF VALVE.

ARCHITECTURE & ENGINEERING 326 East Hoover, Mail Stop B Ann Arbor, MI 48109-1002 Phone: 734-764-3414 Fax: 734-936-3334

> Tom Girard AEC - Architecture & Engineering AF/BB DRAWN BY CVW/VSM New Master • 03/20/15 • Tunnel Revision • 09/09/10

Tunnels

• Tunnel Revision

ISSUED FOR/REVISIO

• 03/05/09

Tool Kit

| University Of Michigan

Ann Arbor , MI

UNIVERSITY OF MICHIGAN ARCHITECTURE, ENGINEERING AND CONSTRUCTI 326 East Hoover, Mail Stop B Ann Arbor, MI 48109-1002 Phone: 734-763-3020 Fax: 734-763-3238 P00009388 J OF M PROJECT NO BUILDING N

Tunnels

Recirculation **DHW Heat** Transfer Package

components sizes, rough-in requirements, piping and wiring diagrams and details, materials of construction, accessories, operating and maintenance clearance requirements. Wiring diagrams shall be project specific, and differentiate between factory wiring and field wiring. Include shop drawings and fabrication drawings for equipment indicating piping connections,

D.Quality Assurance:

E.Operation and Maintenance Manual

2.1 General:

A. The Heat Transfer Package shall be factory assembled

2.10 Piping and fittings:

A.Steam Piping & Fittings:

B.Condensate Piping & Fittings:

C.Domestic Hot Water Piping & Fittings:

electrical energy shall be required. with DIn 1693 GGG 40.3 with a swing type inlet check and shall contain a stainless STEEL float connected to a

- 2.Steam trap shall be purchased with the inline universal connector, which once installed remains permanently in by two bolts to enable simple quick rapid installation
- B.Manufacturers: Spirax-Sarco, Armstrong

2.13 Thermometers

- A. Industrial Glass Thermometer: Adjustable angle, scale to protective aluminum slotted bulb quard and mounting flange.
- 1.Range and accuracy: (+/-) 1 scale div. Except where
- B.Thermometer Wells: Stainless steel, with neck extension for insulated piping, with cap and chain fastened to well.
- aluminum case, black on white face, stainless steel tube, with ASME/ANSI B40-1 Grade 1A.
- E.Except where noted otherwise, select range for twice normal

| 0-100 psig | Comp. Air

A.Provide 1/4" brass pressure and temperature test plugs

- ENGINEER IS RESPONSIBLE FOR ESTABLISHING REQUIRED HEAT DUTY OF THE EXCHANGER, EDIT SCHEMATIC AND DWG TO REFECT PACKAGE DETAILS REQUIRED
- . IF USED IN NEW BUILDINGS USE DDC CONTROLS AND OTHER

INSTALLED BY CONTRACTOR.

TRANSFER | FLOW | DIFFERENTIAL |

. PACKAGE SHALL FIT THROUGH 36"W x 6'-7"H DOORWAY U.N.O. FLOOR MOUNT HORIZONTAL 3. FLOOR MOUNT VERTICAL 4. WALL HUNG

TO BE DETERMINED
BY AVAILABILITY

SHEET NO. 11 OF 13 SHEET FILE NO. TK-9 04 15.dgn